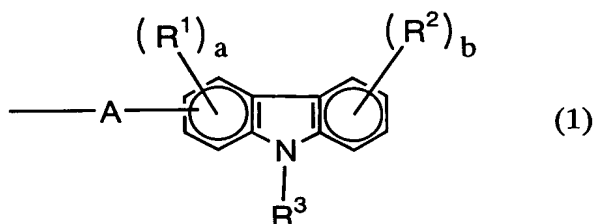
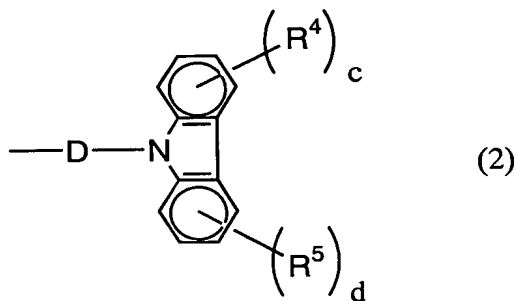


# CLAIMS

1. A metal complex which has a monovalent group having a metal complex structure which represents light emission from triplet excited state, and represented by the following formula (1) or (2),



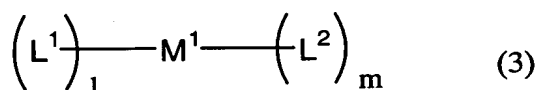
(wherein, A is a single bond or a divalent group derived from conjugate system. R<sup>1</sup> and R<sup>2</sup> each independently represent a halogen atom, alkyl group, alkoxy group, alkylthio group, alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, arylsilyl group, arylalkyl group, arylalkoxy group, arylalkylthio group, arylalkylamino group, arylalkyl silyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, or a monovalent heterocyclic group. R<sup>3</sup> represents alkyl group, aryl group, arylalkyl group, arylalkenyl group, arylalkynyl group, or a monovalent heterocyclic group. a represents an integer of 0 to 3. b represents an integer of 0 to 4. When a is two or more, a plurality of R<sup>1</sup>s may be the same or different. When b is two or more, a plurality of R<sup>2</sup>s may be the same or different.)



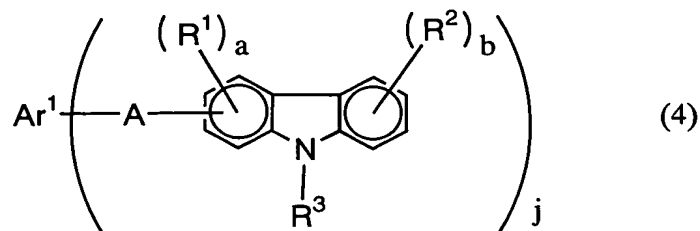
(wherein, D is a single bond or a divalent group derived from conjugate system. R<sup>4</sup> and R<sup>5</sup> each independently represent a halogen atom, alkyl group, alkoxy group, alkylthio group,

alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, arylsilyl group, arylalkyl group, arylalkoxy group, arylalkylthio group, arylalkyl amino group, arylalkyl silyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, or a monovalent heterocyclic group. c and d each independently represent an integer of 0 to 4. When c is two or more, a plurality of R<sup>4</sup>s may be the same or different. When d is two or more, a plurality of R<sup>5</sup> may be the same or different.)

2. A complex represented by the below formula (3), and having phosphorescence in a visible region,

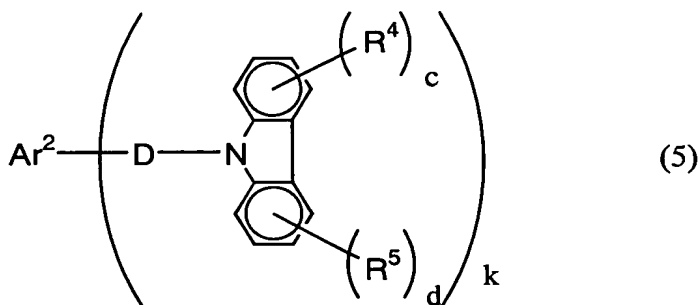


(wherein, M<sup>1</sup> is a metal which is an atom having an atomic number of 50 or more, and intersystem crossing between a singlet state and a triplet state can occur in this complex by spin-orbit interaction. L<sup>1</sup> represents a ligand represented by the following formula (4) or formula (5). L<sup>2</sup> represents: a ligand which bonds to M<sup>1</sup> by one or more of nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom; a halogen atom; or a hydrogen atom. l represents an integer of 1-3. m represents an integer of 0-3. When l is two or more, a plurality of L<sup>1</sup>s may be the same or different. When m is two or more, a plurality of L<sup>2</sup>s may be the same or different. l+m is an integer of 2-6.)



(wherein, Ar<sup>1</sup> represents a residue of a ligand which bonds to M<sup>1</sup> by one or more of nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has covalent bonds to j

pieces of As. j represents an integer of 1 to 3. A, R<sup>1</sup> to R<sup>3</sup>, a, and b are the same as those of the above formula (1).)



(wherein, Ar<sup>2</sup> represents a residue of a ligand which bonds to M<sup>1</sup> by one or more of nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has covalent bonds to k pieces of Ds. k represents an integer of 1-3. D, R<sup>4</sup>, R<sup>5</sup>, c and d are the same as those of the above formula (2).).

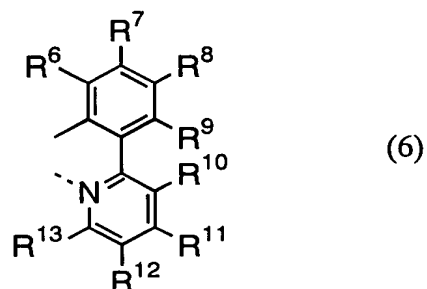
3. A complex according to claim 2, wherein L<sup>1</sup> is a ligand represented by the above formula (4).

4. A complex according to claim 2, wherein L<sup>1</sup> is a ligand represented by the above formula (5), and D is a divalent group derived from conjugate system.

5. A complex according to any one of claims 2 to 4, wherein L<sup>1</sup> bonds to M<sup>1</sup> by one or more nitrogen atoms, and/or one or more carbon atoms.

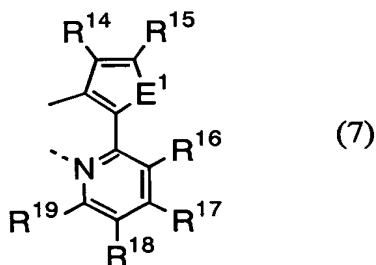
6. A complex according to claim 5, wherein L<sup>1</sup> is a multi-dentate ligand.

7. A complex according to any one of claims 2 to 6, wherein Ar<sup>1</sup> or Ar<sup>2</sup> is a monovalent bidentate ligand represented by the below formula (6) or (7),



(wherein, R<sup>6</sup> to R<sup>13</sup> each independently represent a hydrogen atom, halogen atom, alkyl group, alkoxy group, alkylthio group,

alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, arylsilyl group, arylalkyl group, arylalkoxy group, arylalkylthio group, arylalkylamino group, arylalkylsilyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, monovalent heterocyclic group, or a group represented by the above formula (1) or formula (2). At least one of  $R^6$  to  $R^{13}$  is a group represented by the above formula (1) or formula (2).)



(wherein,  $E^1$  represents an oxygen atom or a sulfur atom.  $R^{14}$  to  $R^{19}$  each independently represent a hydrogen atom, halogen atom, alkyl group, alkoxy group, alkylthio group, alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, arylsilyl group, arylalkyl group, arylalkoxy group, arylalkylthio group, arylalkylamino group, arylalkylsilyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, monovalent heterocyclic group, or a group represented by the above formula (1) or formula (2). At least one of  $R^{14}$  to  $R^{19}$  is a group represented by the above formula (1) or formula (2).).

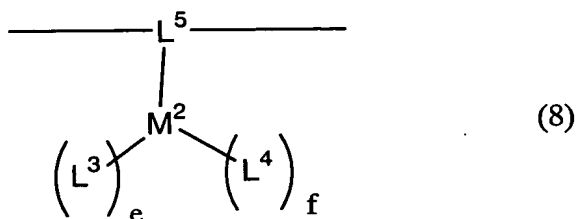
8. A complex according to any one of claims 2 to 7, wherein  $M^1$  is an iridium atom, platinum atom, gold atom, or europium atom.

9. An organic electroluminescent device comprising a layer which contains the complex according to any one of claims 2 to 8 between electrodes consisting of an anode and a cathode.

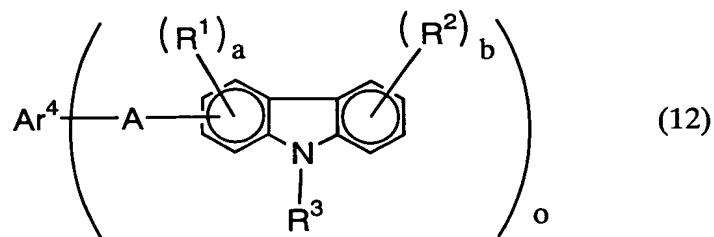
10. A polymeric light-emitting substance wherein said light-emitting substance has a metal complex structure showing light emission from triplet excited state in the main chain

or side chain, and has a monovalent group represented by the above general formula (1) or (2).

11. A polymeric compound according to claim 10, wherein said polymeric compound comprising a repeating unit represented by the below formula (8), (9) or (10), has phosphorescence in a visible region,

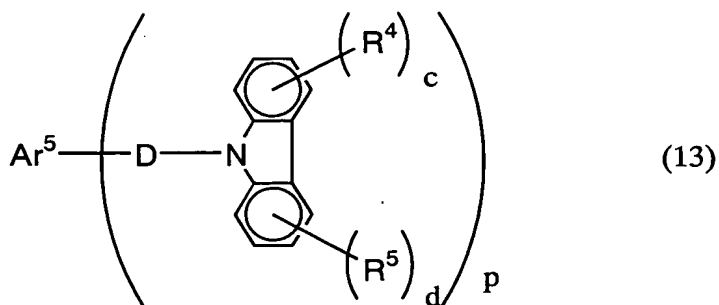


(wherein,  $\text{M}^2$  is an atom having atomic number of 50 or more, spin-orbit interaction occurs in the complex, and the intersystem crossing between a singlet state and a triplet state can occur in the metal.  $\text{L}^3$  represents a ligand represented by the below formula (12) or (13).  $\text{L}^4$  represents: a ligand which bonds to  $\text{M}^2$  with one or more of nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom; a halogen atom; or a hydrogen atom.  $e$  represents an integer of 1-3.  $f$  represents an integer of 0-3.  $\text{L}^5$  is a ligand which bonds to  $\text{M}^2$  with one or more of nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has two bonds connected to two neighboring repeating units with covalent bonding. When  $e$  is two or more, a plurality of  $\text{L}^3$  may be the same or different. When  $f$  is two or more, a plurality of  $\text{L}^4$  may be the same or different.  $e+f$  is an integer of 1-5.)

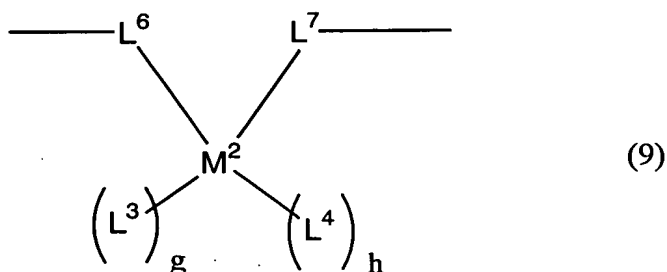


(wherein,  $\text{Ar}^4$  is a residue of the ligand which bonds to  $\text{M}^2$  with one or more nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and bonds to  $o$  pieces of  $\text{As}$ .  $o$  represents an integer of 1-3.  $\text{A}$ ,  $\text{R}^1$ - $\text{R}^3$ ,  $a$  and  $b$  are respectively

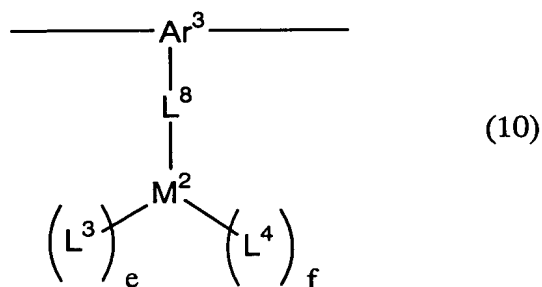
the same as those in the above formula (1).)



(wherein,  $\text{Ar}^5$  is a residue of the ligand which bonds to  $\text{M}^2$  with one or more nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has covalent bonds to  $p$  pieces of  $\text{Ds}$ .  $p$  represents an integer of 1-3.  $\text{D}$ ,  $\text{R}^4$ ,  $\text{R}^5$ ,  $c$ , and  $d$  are respectively the same as those in the above formula (2).)

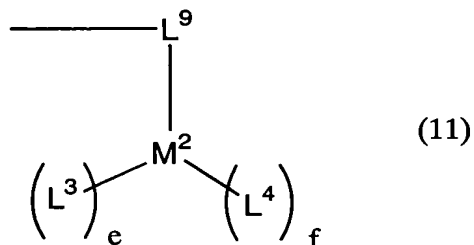


(wherein,  $\text{M}^2$ ,  $\text{L}^3$ , and  $\text{L}^4$  are respectively the same as above.  $\text{L}^6$  and  $\text{L}^7$  are each independently, a ligand which bonds to  $\text{M}^2$  with one or more nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has a covalent bond to one neighboring repeating unit with one free bond, respectively.  $g$  represents an integer of 1-3 and  $h$  represents an integer of 0-3.  $\text{L}^3$ 's may be the same or different. When  $h$  is two or more, a plurality of  $\text{L}^4$ 's may be the same or different.  $g+h$  is an integer of 1-4.)



(wherein,  $M^2$ ,  $L^3$ ,  $L^4$ ,  $e$ , and  $f$  are respectively the same as those in the above formula (8).  $Ar^3$  is a trivalent aromatic group or a trivalent heterocyclic group.  $L^8$  is a ligand which bonds to  $M^2$  with one or more nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has a covalent bond to  $Ar^3$  with one free bond.).

12. A polymeric compound according to claim 10, wherein said polymeric compound has a structure represented by the below formula (11) at the polymer terminal, and has phosphorescence in a visible region.

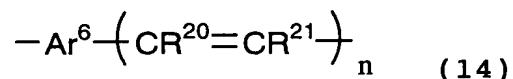


(wherein,  $M^2$ ,  $L^3$ ,  $L^4$ ,  $e$ , and  $f$  are respectively the same as those in the above formula (8).  $L^9$  is a ligand which bonds to  $M^2$  with one or more nitrogen atom, oxygen atom, carbon atom, sulfur atom, or phosphorus atom, and has a covalent bond at the polymer terminal with one free bond.)

13. A polymeric compound according to claim 10, wherein said polymeric compound has a metal complex structure showing light emission from triplet excited state, and has a monovalent group represented by the above formula (1) or (2), on a repeating unit other than said metal complex structure.

14. A polymeric compound according to any one of claims 10-13, wherein the main chain is a conjugated polymer.

15. A polymeric compound according to claim 14, wherein said polymeric compound comprises the repeating unit represented by the following general formula (14),



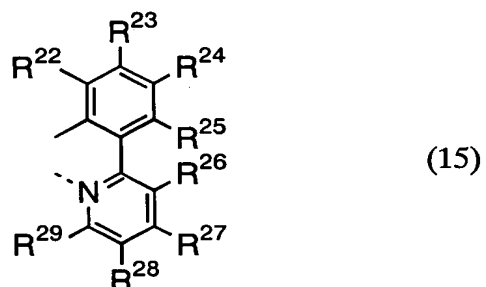
(wherein,  $Ar^6$  represents an arylene group or a divalent heterocyclic group.  $R^{20}$  and  $R^{21}$  each independently represent

a hydrogen atom, alkyl group, aryl group, arylalkyl group, arylalkenyl group, arylalkynyl group, monovalent heterocyclic group, or cyano group. At least one of  $R^{20}$ ,  $R^{21}$ , or the substituents on  $Ar^6$ , represents a group represented by the above formula (1) or (2).  $n$  is 0 or 1.).

16. A polymeric compound according to any one of claims 10-15, wherein at least one ligand of the metal complex portion showing light emission from triplet excited state bonds to a metal through a nitrogen atom and/or a carbon atom.

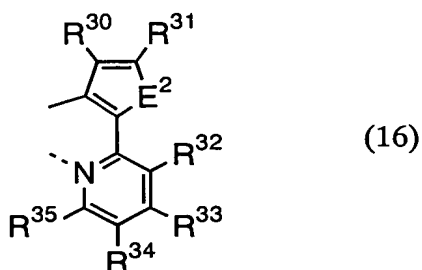
17. A polymeric compound according to any one of claims 10-16, wherein at least one ligand of the metal complex portion showing light emission from triplet excited state is a multi-dentate ligand.

18. A polymeric compound according to any one of claims 10-16, wherein at least one ligands of the metal complex portion showing light emission from triplet excited state is a monovalent bi-dentate ligand represented by the below formula (15) or (16),



(wherein,  $R^{22}$  to  $R^{29}$  each independently represent a hydrogen atom, halogen atom, alkyl group, alkoxy group, alkylthio group, alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, aryl silyl group, arylalkyl group, arylalkoxy group, arylalkylthio group, arylalkylamino group, arylalkylsilyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, or monovalent heterocyclic group. At least one of  $R^{22}$  to  $R^{29}$  is a free bond with a main chain or a side chain.)





(wherein, E<sup>2</sup> represents an oxygen atom or a sulfur atom. R<sup>30</sup> to R<sup>35</sup> each independently represent a hydrogen atom, halogen atom, alkyl group, alkoxy group, alkylthio group, alkylamino group, alkylsilyl group, aryl group, aryloxy group, arylthio group, arylamino group, arylsilyl group, arylalkyl group, aryl alkoxy group, arylalkylthio group, arylalkylamino group, arylalkylsilyl group, acyl group, acyloxy group, imino group, amide group, arylalkenyl group, arylalkynyl group, cyano group, or monovalent heterocyclic. At least one of R<sup>30</sup> to R<sup>35</sup> is a free bond with a main chain or a side chain.).

19. A polymeric compound according to any one of claims 10-18, wherein the central metal of the metal complex portion showing light emission from triplet excited state is an iridium atom, platinum atom, gold atom, or europium atom.

20. An organic electroluminescent device comprising a layer which contains the polymeric compound according to any one of claims 10-19 between electrodes consisting of an anode and a cathode.